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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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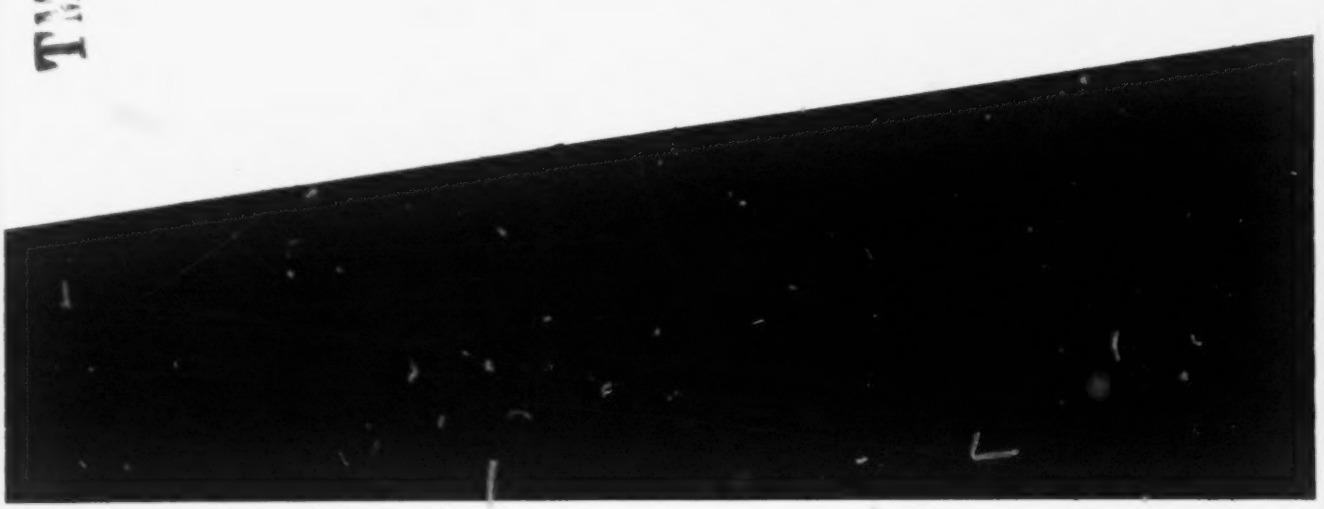
Development of USES Aptitude Test Battery for

Blown Plastic Bottle Machine Operator

(fabric. plastics prod.) 556.885



U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION
BUREAU OF EMPLOYMENT SECURITY

Technical Report on Development of USES Aptitude Test Battery

For .....

Blown Plastic Container Machine Operator

(fabric, plastic prod.) 556.885

S-396

U. S. Employment Service
in Cooperation with
Georgia, Maryland, Massachusetts, Missouri, Ohio
State Employment Services

July 1967

FOREWORD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Frank H. Cassell

Frank H. Cassell, Director
U. S. Employment Service

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Blown Plastic Container Machine Operator
(fabric. plastic prod.) 556.885-016
S-396

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Blown Plastic Container Machine Operator - Standard (fabri. plastic prods.) **556.885-016. The following** norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
G - General Learning Ability	85
P - Form Perception	85
Q - Clerical Aptitude	95

RESEARCH SUMMARY

Sample:
58 male employees of the Owens-Illinois Corporation working in company plants located in five states.

Criterion:
Supervisory ratings.

Design:
Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:
Phi Coefficient = .228 ($p/2 < .05$).

Effectiveness of Norms: Only 60% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 74% would have been good workers. 40% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 26% would have been poor workers. The effectiveness of the norms is shown graphically in Table I:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	60%	74%
Poor Workers	40%	26%

SAMPLE DESCRIPTION

Size: N = 58.

Occupational Status: Employed workers.

Work Setting: Workers were employed at Owens-Illinois Corporation Plastic Products Division plants at the following locations:

Atlanta, Georgia
Baltimore, Maryland
Newburyport, Mass.
St. Louis, Missouri
Cincinnati, Ohio

Employer Selection Requirements:

Education: Varies from ability to read and write English to high school graduation.

Previous Experience: None required.

Tests: Company mechanical aptitude test.

Other: Personal interview with immediate supervisor, company physical, check of previous work or school record, bidding and seniority.

Principal Activities: The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience: All workers had at least one month's experience. At some plants, workers had been hired directly as machine operators; at other plants, workers had been hired into entry level jobs and, by a process of bidding and subsequently demonstrated ability, had advanced to their present classification,

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	Range	r
Age (years)	29.0	7.1	20-52	-.032
Education (years)	11.0	1.5	7-14	-.031
Experience (months)	26.0	18.9	1-69	.164

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B were administered between July and September, 1966.

CRITERION

The criterion consisted of supervisory ratings of job proficiency made at approximately the same time as the tests were administered with a time interval of from two to twelve weeks between the two ratings.

Rating Scale: An adaptation of USES Form SP-21 "Descriptive Rating Scale". The scale (see Appendix) consisted of nine items with five alternatives for each item. The alternatives indicate varying degrees of job proficiency.

Reliability: A reliability coefficient of .802 was obtained between the two ratings. Therefore, the final criterion consists of the combined scores of the two ratings.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	40-89
Mean:	62.2
Standard Deviation:	11.2

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 40% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers". The criterion critical score was 58.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of the job duties involved and a statistical analysis of test and criterion data. Aptitude P which does not have a significant correlation with the criterion was considered for inclusion in the norms because the qualitative analysis indicated that it was important for the job duties and the sample had a relatively high mean score and a relatively low standard deviation for this aptitude. With employed workers, a relatively low standard deviation indicates that some pre-selection may have taken place and this restricted range of scores (low standard deviation) will depress the correlation between the aptitude and the criterion. A relatively high mean score with employed workers may also indicate some sample pre-selection. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3
Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed.)

Aptitude	Rationale
P - Form Perception	Required in visual and instrument inspection of product and in making operating adjustments.
Q - Clerical Perception	Necessary for accurate reading of guages, controls and measuring devices, and inspection.
M - Manual Dexterity	Needed to operate, set-up, and adjust machinery.

TABLE 4
Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitude	Mean	SD	Range	r
G - General Learning Ability	95.2	15.7	64-138	.273*
V - Verbal Aptitude	92.5	13.8	66-133	.238
N - Numerical Aptitude	93.5	15.9	59-125	.232
S - Spatial Aptitude	105.4	18.7	71-150	.148
P - Form Perception	107.4	14.3	76-144	.044
Q - Clerical Aptitude	105.5	14.1	81-129	.276*
K - Motor Coordination	97.1	15.8	70-144	.166
F - Finger Dexterity	100.1	16.9	61-134	.141
M - Manual Dexterity	102.4	17.7	67-130	.063

*significant at the .05 level

TABLE 5
Summary of Qualitative and Quantitative Date

Type of Evidence	Aptitudes G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X	X			X
Irrelevant									
Relatively High Mean				X	X	X			
Relatively Low Standard Deviation		X			X	X			
Significant Correlation with the Criterion	X					X			
Aptitudes to be Considered for Trial Norms	G				P	Q			

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitude G, P and Q at trial cutting scores were able to differentiate between the 60% of the sample considered good workers and the 40% of the sample considered poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores of slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of G-85, P-85, and Q-95 provided optimum differentiation for the occupation of Blown Plastic Container Machine Operator 556.885. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .23 (statistically significant at the .05 level).

TABLE 6
Concurrent Validity of Test Norms G-85, P-85, Q-95

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	26	35
Poor Workers	11	12	23
Total	20	38	58

Phi Coefficient (ϕ) = .23 Chi Square (X^2) = 3.02
Significance Level = P/2 $<$ .05

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-12 which is shown in Section II of the Guide to the Use of the General Aptitude Test Battery. A Phi Coefficient of .22 is obtained with the OAP-12 norms of G-95, P-95, Q-100.

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE

Score_____

RATING SCALE FOR_____
(D.O.T. Title and Code)

Directions: Please read the attached "INSTRUCTIONS TO RATERS", and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print)_____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

[ ] See him at work all the time.

[ ] See him at work several times a day.

[ ] See him at work several times a week.

[ ] Seldom see him in a work situation.

How long have you worked with him?

[ ] Under one month.

[ ] One to two months.

[ ] Three to five months.

[ ] Six months or more.

1. MACHINE SETUP: Compared with other operators, how well can he assist a changeover of a machine from one production run to the next to obtain maximum quantity and quality of product?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

   [ ] Above average. Could be considered as being in the upper third of all operators working for the company.

   [ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

2. MACHINE PRODUCTION: How well does he avoid making operating errors which result in poor quality or quantity of production?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

   [ ] Above average. Could be considered as being in the upper third of all operators working for the company.

   [ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

3. INSPECTION; Compared with other operators, how well does he control the quality and weight of the bottles being produced on his machines?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

   [ ] Above average. Could be considered as being in the upper third of all operators working for the company.

   [ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

4. MACHINE MAINTENANCE: How effective is he in locating and correcting minor mechanical, electrical, and hydraulic malfunctions?

[ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

[ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

[ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

[ ] Above average. Could be considered as being in the upper third of all operators working for the company.

[ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

5. PRODUCTION RECORDS: How complete and accurate are his production records compared with those for other operators?

[ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

[ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

[ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

[ ] Above average. Could be considered as being in the upper third of all operators working for the company.

[ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

6. WORK ORGANIZATION: How well does he organize his own work and the work of other persons who are helping him?

[ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

[ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

[ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

[ ] Above average. Could be considered as being in the upper third of all operators working for the company.

[ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

7. RESOURCEFULNESS: How well is he able to figure out what to do when an operating problem occurs on one machine? On more than one machine?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

   [ ] Above average. Could be considered as being in the upper third of all operators working for the company.

   [ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

8. FLEXIBILITY: How quickly can he learn new operations involved in either an equipment or a product change?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

   [ ] Above average. Could be considered as being in the upper third of all operators working for the company.

   [ ] An outstanding operator in this respect. Probably falls within the top 10% of all operators employed by Owens-Illinois.

9. OVERALL JOB KNOWLEDGE: Compared with other operators, how well does he know all phases of this job?

   [ ] Has demonstrated very definite limitations in this respect. His performance is probably like that of the lower 10% of all operators employed by Owens-Illinois.

   [ ] Shows somewhat limited capabilities in this aspect of the job. Could be considered as being in the lower third of all operators working for the company.

   [ ] Satisfactory. In this respect, he probably falls somewhere near the average of all operators.

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FACT SHEET

Job Title: Blown Plastic Container Machine Operator (fabric. plastic prod.) 556.885-016

Job Summary: Under general direction of Shift Supervisor or other designated individuals, is responsible for setting up, operating, and making necessary adjustments and minor mechanical repairs to a battery (3 or 4) of blown plastic container machines that automatically blow and form plastic containers from molten plastic.

Work Performed: Makes mold changes, equipment maintenance and repair, machine set-ups, operating adjustments, and performs the tasks involved in machine operation.

Makes periodic checks of heat controls, cooling water temperatures, pressures, and the general functioning of extruder and hydraulic pumping units. Starts and/or stops machine. Performs preventive maintenance procedures.

Makes frequent visual and instrument quality inspection of the product by observing containers coming from the machine for specification conformance such as weight deviation, sidewall thickness, flash, unfilled pourout, poor distribution or cocked sections, color and surface defects. Uses simple scales, gauges, and electronic measuring devices. Makes necessary adjustments to correct container flaws.

Grinds tails and scrap in unit grinders.

Clears jams that may occur in the conveyor systems.

Positions drums of molding compound at machines.

Maintains various production records as required.

Maintains safety requirements and keeps work space neat, clean, orderly.

May be required to blend regrind and virgin molding compound.

Effectiveness of Norms:

Only 60% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 74% would have been good workers. 40% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 26% would have been poor workers.

Applicability of S-396 Norms:

The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 929-706